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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* URI COHEN

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Appeal 2009-001403  
Application 10/688,333  
Technology Center 1700

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Decided: April 30, 2010

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Before CHUNG K. PAK, CHARLES F. WARREN, and  
MARK NAGUMO, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner rejecting for at least the second time claims 1-10 and 29-43 in the Office Action mailed September 5, 2009. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2007).

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a method for electrofilling a metal or alloy inside of at least one opening surrounded by a field on a front surface of a substrate, and is representative of the claims on appeal:

1. A method for electrofilling a metal or alloy inside at least one opening surrounded by a field on a front surface of a substrate, wherein at least one surface inside the at least one opening comprises an exposed metallic surface, said method comprising steps of:

- (a) immersing the substrate in an activation or wetting solution;
- (b) applying ultrasonic or megasonic vibrations to the substrate; and after commencing step (b):
- (c) applying high pressure jets of an electrolyte to the substrate, said electrolyte comprises metallic ions of said metal or alloy; and
- (d) applying an electroplating current to the substrate to electroplate said metal or alloy inside the at least one opening;

wherein the activation or wetting solution is the same as the electrolyte, and wherein steps (a), (b), (c), and (d) are performed in the same chamber.

The Examiner relies upon the evidence in these references (Ans. 3):<sup>1</sup>

Langner	US 4,834,842	May 30, 1989
Tzanavaras	US 5,421,987	Jun. 6, 1995
Reynolds	US 5,904,827	May 18, 1999
Zhao	US 6,071,809	Jun. 6, 2000
Downes, Jr. (Downes)	US 2002/0189637 A1	Dec. 19, 2002

Appellants request review of the following grounds of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner (App. Br. 4):

claims 1, 3-5, and 29-32 over Tzanavaras in view of Downes with evidence from Zhao (for claims 4, 5, 31, and 32) (Ans. 3);

claims 2, 7-9, 34-37, and 39-42 over Tzanavaras in view of Downes as applied to claims 1 and 29, and further in view of Langner with evidence

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<sup>1</sup> We consider the Appeal Brief filed April 4, 2008, the Examiner's Answer mailed June 5, 2008, and the Reply Brief filed August 4, 2008.

from Zhao (for claims 8, 9, 36, 37, 41, and 42) (Ans. 5);  
claims 6 and 33 over Tzanavaras in view of Downes as applied to claims 1 and 29, and further in view of Reynolds (Ans. 7);  
claims 10 and 38 over Tzanavaras in view of Downes and Langner as applied to claims 2 and 34, and further in view of Reynolds (Ans. 7); and  
claim 43 over Tzanavaras in view of Downes and Langner as applied to claims 39-42, and further in view of Reynolds (Ans. 8).

Appellant argues the first ground of rejection based on the claims as a group, and specifically argues claims 4, 5, 31, and 32 on the basis of independent claims 1 and 29. App. Br., e.g., 7 and 9. Appellant argues the second ground of rejection based on claims 2, 7-9, and 34-37, and on claim 39 with respect to claims 39-42. App. Br. 16-17. Appellant argues the third and fourth grounds of rejection based on the claims as a group. App. Br. 19. and 22. Thus, we decide this appeal based on claims 1, 2, 6, 10, 39, and 43 as representative of the grounds of rejection and Appellant's groupings of claims. 37 C.F.R. § 41.37(c)(1)(vii) (2007).

### Opinion

We considered the totality of the record in light of Appellant's arguments and the evidence, including Appellant Cohen's Declaration<sup>2</sup> (Cohen Declaration) with respect to claims 1, 2, 6, 10, 39, and 43 and the grounds of rejection advanced on Appeal. See, e.g., *In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary

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<sup>2</sup> Declaration under 37 C.F.R. § 1.132 by Appellant Cohen executed December 19, 2006, and filed with the Amendment filed December 22, 2006. See App. Br. Evidence Appendix.

indicia of nonobviousness.”) (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)); *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) (“After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument.”) (citing, inter alia, *In re Spada*, 911 F.2d 705, 707 n.3 (Fed. Cir. 1990)).

We are of the opinion Appellant’s arguments in the Briefs have not established that the evidence in the totality of the record, including the Cohen Declaration, weighs in favor of the nonobviousness of the claimed method for electrofilling a metal or alloy inside of at least one opening surrounded by a field on a front surface of a substrate encompassed by claims 1, 6, 10, 39, and 43. In this respect, we are in substantial agreement with the Examiner’s analysis of the evidence in the references and the Cohen Declaration, and the legal conclusions stated in the Answer, to which we add the following for emphasis with respect to Appellant’s arguments.

Claim 1: Tzanavaras and Downes

The dispositive issue in this appeal is whether the problem of uniformly electroplating vias, holes, and other openings (“openings”) of different aspect ratios in the surface of a substrate would have led one of ordinary skill in the art to combine the teachings of Tzanavaras and Downes, and thence to a method of degassing the interior of at least one opening of the substrate immersed in an electroplating electrolyte by application of ultrasonic vibrations, as taught by Downes, prior to applying high pressure jets of the electrolyte to the substrate in the same electroplating chamber, as taught by Tzanavaras, in the reasonable expectation of successfully

electrofilling a metal or alloy to any extent in the interior of the opening as required by the limitations of claim 1. In this respect, the combination of Tzanavaras and Downes is basic to each of the grounds of rejection.

The Examiner finds that Downes recognized that the problem with wetting the interior surfaces of openings in a substrate caused by air in the openings can be avoided by degassing the openings using ultrasonic vibrations. Ans. 4. The Examiner concludes that the combination of Tzanavaras and Downes would thus have led one of ordinary skill in the art to modify the method of Tzanavaras by applying ultrasonic vibrations to the substrate in an electrolyte prior to commencing electroplating using high pressure jets. Ans. 4. The Examiner further concludes that one of ordinary skill in the art would have recognized that the ultrasonic vibrations “were needed when the substrate was immersed in the electrolyte” and thus, would “have applied the vibrations within the electroplating chamber.” Ans. 5.

Appellant submits the Examiner’s position is based on hindsight because it ignores the teachings of Tzanavaras “that electrolyte jets alone provide efficient agitation and, therefore, full wetting inside all openings,” including openings with widths disclosed by Downes with respect to applying ultrasonic vibrations. App. Br. 7. Thus, Appellant argues that one of ordinary skill in the art “would understand that [Downes’] ultrasonic . . . prewetting step, at best, could only provide functionality that was already present in [Tzanavaras].” App. Br. 7-8, citing Tzanavaras col. 1, ll. 34-38, and col. 3, ll. 13-34.

Appellant contends he discovered that contrary to Tzanavaras, “high

pressure electrolyte jets alone [are] insufficient for full wetting inside deep openings;” that contrary to Tzanavaras and Downes, “insufficient electrolyte wetting is more prevalent inside wider openings than inside narrower openings (a newly discovered wetting problem); and that ‘the source of the newly discovered wetting problem . . . is due to smaller capillary forces insider wider openings than inside narrower openings.” App. Br. 10. Appellant argues the “discovers are unpredictable” in light of the teaching in Tzanavaras that “electrolyte jets alone can accomplish full wetting inside all openings (including the smallest, deepest, and highest aspect ratio openings),” and the teachings in Downes and Tzanavaras that insufficient wetting is more prevalent in higher aspect ratio openings than in lower aspect ratio openings. App. Br. 10, citing Downes ¶¶ 0024 and 0042, and Tzanavaras col. 3, ll. 17-22. Appellant submits that the discovery of the source of the problem must be considered in determining patentability. App. Br. 10.

Appellant submits that the evidence in the Declaration establishes the surprising and unexpected discovery that high pressure electrolyte jets alone will not fully wet deep openings, and that insufficient wetting increases with increasing width of the deep openings. App. Br. 14 and 15, citing Cohen Decl. pp. 3-6, Table I, and Figs. 2A-D; Tzanavaras col. 3, ll. 17-22; and Downes ¶¶ 0024 and 0042; *see also* Reply Br. 4-6. Appellant points out that the evidence in the Declaration shows that electrolyte jets alone will wet close to 100% inside 6  $\mu\text{m}$  wide vias but only 48% inside 55  $\mu\text{m}$  wide vias. App. Br. 14. Appellant further points out that the discovery of diminishing capillary action with increasing opening widths is set forth in

the Specification. App. Br. 14-15, citing Spec. ¶ 0013.

Appellant further submits that Tzanavaras and Downes both teach away from the claimed method. According to Appellant, Tzanavaras teaches away by disclosing that electrolyte jets alone provide sufficient agitation for electrolyte penetration and wetting inside all opens. App. Br. 11-12, citing Tzanavaras col. 3, ll. 13-34; *see also* Reply Br. 1-2. Appellant contends that Downes “teaches away from having the activation or wetting solution be the same as the electrolyte” in teaching “a different pre-wetting solution than the plating solution, and to perform the pre-wetting step in a separate chamber than the plating chamber.” App. Br. 8-9, 11, and 12-13, citing Downes ¶¶ 0022, 0028, 0031, 0033, and 0040; *see also* Reply Br. 2-4.

We find Tzanavaras would have acknowledged to one of ordinary skill in the art that it was known in the art that precision electroplating requires a high degree of uniformity in filling openings of different aspect ratios on a substrate, and non-uniformity electroplating often occurs in openings of different aspect ratios “due to insufficient agitation and replenishment of the minor constituent(s) inside deep and narrow opening areas.” Tzanavaras col. 1, ll. 14-27. Tzanavaras illustrates the openings which are 5-7  $\mu\text{m}$  wide and 12-17  $\mu\text{m}$  deep and are 50-75  $\mu\text{m}$  wide and 4-5  $\mu\text{m}$  deep, with the aspect ratios of openings across the substrate varying from about 1:10 or less to about 3:1 or greater. Tzanavaras col. 1, ll. 34-45.

We find Tzanavaras would have disclosed to one of ordinary skill in the art that a solution to the uniformity problem for openings of all aspect ratios is the application of high pressure jets of electroplating electrolyte to create turbulent flow at the substrate surface. Tzanavaras discloses that this



provides “efficient agitation and replenishment” with “[h]igh aspect ratio opening areas receive a similar degree of agitation (and replenishment) as areas of lower aspect ratios,” which improves plating uniformity and increased plating rate. Tzanavaras col. 2, l. 58 to col. 3, l. 24. Tzanavaras discloses that “pulsating action allows for pressure relaxation and outflow of depleted solution from the opening” when the jets are inactive, and the injection of fresh solution into the openings when the jets are active, and the turbulent flow and pulsating action prevents formation of stagnant and depleted solution in the openings. Tzanavaras col. 3, ll. 24-34. Tzanavaras discloses that improvements obtain “with aspect ratios ranging from 1:10 to 3:1 or greater.” Tzanavaras col. 9, ll. 58-63.

We find Downes would have acknowledged to one of ordinary skill in the art that it was known in the art that substrates can have 2000 to 3000 openings, which can have a diameters within a range of about 0.001 to 0.002 inches, that is, about 25.4 to 50.8  $\mu\text{m}$ , at high aspect ratios of 6-8:1, and that can be difficult to “satisfactorily completely wet or plate the inside of the holes due to the occluding presence of air or gas bubbles.” Downes ¶ 0003. “[I]n the event that even if a single hole is not adequately copper-plated then the entire apertured module comprising of the printed circuit board must be discarded.” Downes ¶ 0003. “[I]t is of extreme importance to . . . provide an adequate wetting of the holes or vias . . . prior to the effectuating of an electroless copper plating pre-cleaning process step, in order to ensure that all of the interior surfaces of the vias or holes are adequately prepared for the electroless copper plating process.” Downes ¶ 0003. Downes discloses that prior art “pre-wetting or cleaning actions are

primarily implemented in . . . liquids in a generally stagnant or static environment, which frequently may be inadequate to fully remove entrapped air or gas bubbles . . . particularly form internally of the small-diameter high-aspect ratio holes or vias . . . of printed circuit board panels.” Downes ¶ 0019.

We find Downes would have disclosed to one of ordinary skill in the art that the air bubble problem can be solved by the disclosed method of degassing small high-aspect ratio openings in printed circuit boards “prior to the wet chemical processing of the [printed circuit boards], such as the copper plating of the surface area of the drilled” openings “in order to remove any air or gas bubbles from the vias tending to inhibit the reliable plating thereof.” Downes abstract and ¶ 0002. Downes also states that “the numerous small high aspect ratio . . . holes or vias . . . are degassed through the intermediary of a continuously flowing liquid, such as but not limited to deionized and essentially degassed water.” Downes ¶ 0021; *see also* ¶¶ 0028 and 0031.

Downes discloses that the method can be carried out by a degassing step using “ultrasonic pretetting in a deionized water or other suitable liquid bath preceding cleaning” to remove air from the vias to allow “subsequent process cleansing solutions to easily flow into the respective” openings. Downes ¶ 0004; *see also* ¶¶ 0022 and 0025. “[T]he generated ultrasonic energy field due to the action of ultrasonic transducers serves primarily to promote acoustic microstreaming within the vias, thus shorting the path of diffusion of the air in the liquid by virtue of circulation,” and the ultrasonic field produced serves to maintain the degassed condition of the

bath. Downes ¶ 0023.

Downes discloses in the embodiment illustrated in Downes Figure 1, the “pre-wetting treatment of articles prior to a contemplated wet chemical processing,” wherein the printed circuit boards have openings of small high aspect ratio diameters, each preferably 0.001 to 0.002 inches, that is, about 25.4 to 50.8  $\mu\text{m}$ , with high aspect ratios ranging between 6-8:1, “although other sizes and diameters and aspect ratios are equally applicable to be treated by the inventive degassing method.” Downes ¶ 0033. “Upon completion of the prewetting process, which maybe [sic] a first step preceding an electroless copper plating or precleaning process sequence, the panels may be conveyed to a subsequent process tank.” Downes ¶ 0040.

We find Downes discloses

[0024] Although so-called panel bumping and panel tilting have been employed in the technology in order to remove air from drilled holes prior to and/or during the plating processes, this maybe somewhat effective for larger-sized holes or vias, but remains essentially ineffective for smaller holes or vias, particularly those possessing high-aspect ratios.

In this respect, we find Downes acknowledges that “potentially for small diameter . . . vias with small aspect ratios, agitation in a fully degassed tank (without ultrasonic energy) may be sufficient to dissolve and eliminate all of the air bubbles which are present in the bath or liquid.” Downes ¶ 0005. This may be accomplished by mechanical vibration or agitation in a fully degassed tank. Downes ¶ 0042.

Our consideration of the combined teachings of Tzanavaras and Downes as a whole in light of the totality of the record and Appellant’s arguments do not convince us that the Examiner erred in concluding that the

claimed method encompassed by claim 1 would have been obviousness to one of ordinary skill in the art. Indeed, we are of the opinion that the problem of uniformly electroplating openings of different aspect ratios in the surface of a substrate as disclosed by each of Tzanavaras and Downes would have led this person to combine the teachings of references, and thence to a method of degassing of at least one opening of the substrate immersed in an electroplating electrolyte by application of ultrasonic vibrations, as taught by Downes, prior to applying high pressure jets of the electrolyte to the substrate in the same electroplating chamber, as taught by Tzanavaras, in the reasonable expectation of successfully electrofilling a metal or alloy to any extent in the at least one opening as required by the limitations of claim 1.

We are not persuaded of a different view of the record by Appellant's position. Appellant essentially advances two arguments. First, Appellant argues that the teachings of each of Tzanavaras and Downes would not have led one of ordinary skill in the art to combine the references because this person would have recognized that the combination of methods would provide a "belt and suspenders" solution to the problem of incomplete and non-uniform plating of all of the interior surfaces of openings of the substrate, regardless of dimension and aspect ratio, that was known in the prior art as acknowledged by both Tzanavaras and Downes. *See above* pp. 7 and 8-9. We disagree.

We are of the opinion that one of ordinary skill in the art would have used a known method or a combination of known methods where the method or methods would provide this person with the assurance that all openings of the substrate, regardless of dimension and aspect ratio, would be plated in

order to avoid producing a defective substrate, as acknowledged by Downes. *See above* pp. 8-9. Indeed, both Tzanavaras and Downes disclose the advantages of their respective methods over methods in which a solution is applied in a stagnant environment or forms stagnant and depleted solution in the interior of vias and holes. *See above* pp. 8 and 9.

In this respect, while Tzanavaras' jets and Downes' ultrasonic vibrations both provide agitation leading to flow within the openings, we determine that one of ordinary skill in the art would have recognized that the application of ultrasonic vibration to the plating solution removes air and bubbles from openings to provide more uniform wetting of the interior surfaces of the openings as taught by Downes. *See above* pp. 7-8 and 9-10. Thus, this person would have reasonably predicted from the references that the application of ultrasonic vibration as taught by Downes prior to further wet processing using Tzanavaras' jets would successfully provide plating solution flow into openings from which air and bubbles have been removed. *See, e.g., KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 415-16 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."); *In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006); *In re Sovish*, 769 F.2d 738, 742-43 (Fed. Cir. 1985) (skill is presumed on the part of one of ordinary skill in the art); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is . . . what the combined teachings of the references would have suggested to those of ordinary skill in the art."); *see also Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364 (Fed. Cir. 2007) ("the expectation of success need only be reasonable, not absolute"); *In re O'Farrell*, 853 F.2d

894, 903-04 (Fed. Cir. 1988) (“For obviousness under § 103, all that is required is a reasonable expectation of success.”).

Furthermore, while Downes illustrates the use of ultrasonic vibration in a pre-cleaning step conducted in a separate chamber, there is no dispute that Downes would have disclosed to one of ordinary skill in the art that ultrasonic vibration can be used to remove air and bubbles in different applications where liquid is applied to the interior surfaces of vias and holes in the same chamber.<sup>3</sup> See, e.g., Reply Br. 3:1-3 (Downes “does not specifically exclude an ultrasonic prewetting step in the same (electrolyte) liquid and (ECD) chamber as in a subsequent plating step.”). See, e.g., *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976) (“The fact that neither of the references expressly discloses asymmetrical dialkyl moieties is not controlling; the question under 35 USC 103 is not merely what the references expressly teach, but what they would have suggested to one of ordinary skill in the art at the time the claimed invention was made.”).

Thus, on this record, we cannot subscribe to Appellant’s arguments that the Examiner erred in using hindsight in combining Tzanavaras and Downes, or in failing to find that the teachings of Tzanavaras and Downes, either separately or combined, when considered as a whole would have taught away from the claimed method. See *above* pp. 5 and 7. Indeed, on this record, as a matter of fact, the teachings of Tzanavaras and Downes

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<sup>3</sup> It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, see *In re Fritch*, 972 F.2d 1260, 1264-65 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826 (CCPA 1968), presuming skill on the part of this person. *Sovish*, 769 F.2d at 743.

neither conflict nor otherwise would have discouraged one of ordinary skill in the art from combining the same and thus from arriving at the claimed method encompassed by claim 1. *See, e.g., Depuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (citing *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)) (“A reference does not teach away, however, if it merely expresses a general preference for an alternate invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the claimed invention.”); *Ormco Corp. v. Align Tech. Inc.*, 463 F.3d 1299, 1308-09 (Fed. Cir. 2006); *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165, 1166-67 (Fed. Cir. 2006).

Second, Appellant argues that the claimed method is based on the discovery that wider, lower aspect openings have a smaller capillary force therein, thus rendering the high pressure electrolyte jets of Tzanavaras alone insufficient for wetting such openings, as established by the evidence in the Cohen Declaration, which discovery is unexpected and surprising in view of the teachings of Tzanavaras to use jets alone and the teachings in Tzanavaras and Downes that wetting is a problem in higher aspect ratio openings. *See above* pp. 6-7. The Examiner does not dispute the data in the Cohen Declaration which was obtained with high pressure electrolyte jets alone. Ans. 10. *See above* pp. 6-7. We disagree with the conclusions that Appellant would have us draw from the disclosures of Tzanavaras and Downes and the evidence in the Cohen Declaration.

The difficulty we have with Appellant’s position is that the combined teachings of Tzanavaras and Downes would have reasonably led one of ordinary skill in the art to use Downes’ ultrasonic vibration step prior to the

application of Tzanavarases' electrolyte jets with respect to any substrate having openings, as indeed, each of the references teach that the agitation method disclosed therein is effective with all of the openings of the substrate, regardless of dimension and aspect ratio. *See above* pp. 7-8 and 9-10. We determine the combined teachings of the references corresponds to the scope of claim 1 which does not specify any dimension or aspect ratio of the at least one opening that must be electroplated, as the Examiner points out, and further does not specify the extent to which the at least one opening is electroplated. Ans. 10. Thus, on this record, the fact that Appellant has discovered a further reason to combine the references to arrive at the claimed method encompassed by claim 1 does not patentably distinguish claim 1 over the combined teachings of Tzanavaras and Downes. *See, e.g., In re Beattie*, 974 F.2d 1309, 1312 (Fed. Cir. 1992) ((citing, inter alia, *In re Kronig*, 539 F.2d 1300, 1304 (CCPA 1976)) ("As long as some motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor."); *In re Kemps*, 97 F.3d 1427, 1430 (Fed. Cir. 1996) (citing *In re Dillon*, 919 F.2d 688, 693 (Fed. Cir. 1990) (*en banc*)).

Furthermore, we agree with the Examiner's position that Downes illustrates the effectiveness of ultrasonic vibration process for wetting the interior surfaces of vias and holes that have openings in the 25.4 to 50.8  $\mu\text{m}$  range, and thus the evidence in the Cohen Declaration establishing that the ultrasonic vibration process of Downes would be useful with vias and holes with openings that fall within or are close to this range would have been



expected by one of ordinary skill in the art. Ans. 10. Indeed, on this record, Appellant's elucidation that the mechanism of Tzanavarases' process is more effective at dimensions and aspect ratios below Downes' range, and thus the discovery of a new benefit of combining Downes' process with Tzanavarases' process, does not render patentable the process suggested to one of ordinary skill in the art by the combination of Tzanavaras and Downes simply because those practicing the combined processes may not have appreciated the mechanism or the results produced thereby from the disclosures of the references. *See, e.g., In re Woodruff*, 919 F.2d 1575, 1577 (Fed. Cir. 1990); *W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1548 (Fed. Cir. 1983) ("[I]t is . . . irrelevant that those using the invention may not have appreciated the results[,] . . . [otherwise] it would be possible to obtain a patent for an old and unchanged process." (citations omitted)).

We note again here that Appellant's arguments with respect to claims 4, 5, 31, and 32, under a separate heading, rely on the positions advanced with respect to claim 1. App. Br. 9; *see above* p. 3. Indeed, Appellant contends that "Zhao's disclosure . . . has no effect on the argument set forth above (and below) regarding [Tzanavaras] in view of [Downes]." App. Br. 9. Thus, our consideration of Appellant's previous position also applies to these claims.

Claims 2 and 39: Tzanavaras, Downes, and Langner

Appellant submits in argument with respect to each of claims 2 and 39 that Langner does not affect arguments previously advanced with respect to Tzanavaras and Downes, and arguments with respect to Zhao. App. Br. 16-18. We agree with Appellant that claim 39 is similar to claim 1 and indeed,

claims 1 and 39 both encompass methods wherein the inside surfaces of the at least one opening are wetted by the application of ultrasonic vibration which is addressed by the Examiner's grounds of rejection of these claims and responded to by Appellant. *See* App. Br. 17 and 23. Thus, our consideration of Appellant's previous position with respect to Tzanavaras and Downes applies to claims 2 and 39 as well.

Claim 6: Tzanavaras, Downes, and Reynolds

Claims 10 and 43: Tzanavaras, Downes, Langner, and Reynolds

Appellant addresses these grounds of rejection based on Reynolds, arguing that Reynolds does not affect previous arguments with respect to Tzanavaras and Downes. Appellant further does not support the arguments that Reynolds does not apply to claims 6, 10, and 43 for the reasons set forth by the Examiner. Thus, our consideration of Appellant's previous position with respect to Tzanavaras and Downes also applies to these claims.

Conclusion

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Tzanavaras and Downes alone and as further combined with Zhao, Langner, and Reynolds with Appellant's countervailing evidence of and argument for nonobviousness, including the Cohen Declaration, and conclude, by a preponderance of the evidence and weight of argument, that the claimed invention encompassed by appealed claims 1-10 and 29-43 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner's decision is affirmed.

Appeal 2009-001403  
Application 10/688,333

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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